POLLUTION AND PROTECTION OF SURFACE AND UNDERGROUND WATERS AS A FOLLOWING OF THE MINING ACTIVITIES IN THE PERIMETER OF PESTEANA NORD

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Abstract**:One of the problems facing any mine of coal exploitation is that one of the disturbance of the regimen and pollution of surface and groundwater. If the operation is done in open cast mines, it is disturbed the flow of the underground waters by changing the direction flow and creating a hydrostatic vacuum in the area of intersecting the groundwater aquifer. Surface waters are also affected, thus, they may disappear or valleys or interposed rivers may appear.**

Keywords:surface and underground waters, wastewater.

1. INTRODUCTION

The open cast mine Pesteana Nord is a part of the mining basin Rovinari, Gorj County, being situated in the southern part of the basin, approx. 40 km away from Tg. Jiu and 15 km from Rovinari. The area of exploitation includes the area of meadow situated near the river Jiu, Jiu around the localities Pesteana-Jiu and Cocoreni, extending westerly to the edge of the hilly area,on the alignment of the localities Pesteana de Jos, Urdari and Hotaroasa.

2. WATER RESOURCES

2.1. Surface waters

The hydrographic network in the area is represented by the Jiu river and its tributaries, consisting of streams that form the valleys, namely:
- from the right slope: ValeaPârâului, ValeaFântânii, ValeaPlopului and ValeaMânăstirii ;
-from the left side: Cioiana fleet.

The Jiu river bed and the beds of the tributary valleys, on their lower course, are regularized. The open-pit mine was opened and keeps expanding in the area where it was situated the Jiu river bed before its regularization.

Water management works as necessary for the proper functioning of Pesteana Nord open-pit mine are:
- Regularization (regularization of the river Jiu);
- Guard ditches;
- Dewatering.

2.2. Groundwater

The physical - geographical and geological - lithological conditions of the basin are favorable to the accumulation of significant reserves of groundwater and permanent renewal thereof. The hydro -geological research works, executed in the open-pit mine and in the adjacent areas, have revealed more underground water horizons, which depending on the local erosion basis, include[1,2]:

- Groundwater with free level (phreatic water);
- Groundwater under artesian pressure levels or artesian waters.

Ground waters are found in Quaternary deposits and sometimes in the Roman or Dacian deposits in the feeding area of the deep aquifers. The groundwater under pressure are stationed both in Dacian and Roman sands.

Horizon of aquifer phreatic water - is one of the main horizons encountered in the basin. It is stationed in Quaternary alluvial deposits that form the meadow and lower terraces of the Jiu valley.

Pressure aquifers are confined in intercalations and sands located in bunk-beds and the roof layers of charcoal, in the existing cracks of the layers, which do not form independent layers but are associated with waters from aquifers that are in contact with the coal

Within the Rovinari basin, the coal complex aquifers have not a continue spread, the drilling research highlighting their feature of having a form of lens. The porous rocks, sand, sand clay, sandy powder, gradually underlay into impermeable rocks so that so frequently their rigorous delimitation is very difficult.

The areas of spreading of the aquifers in the productive complex took shape based on the information of all operational, geological and hydro-geological executed drillings. The operated hydro-geological research led to the identification and individualization of all aquifers in the intervals between the layers of lignite, discontinuous and unevenly spread with supplying areas, both in the area of the basin edge and inside of drainage and with the possibilities dictated by the valleys that cross the perimeter.

The hydrostatic levels depend directly on the local power quotas and drain hydraulic communication possibilities[5,6]:

These groundwater chemistry is similar to the underground waters.

The supplying is done by waters of rainfall on interior rivers and surface waters through the valleys of the region's river network. The large area of infiltration and permanence of supply sources have contributed to the accumulation of reserves in Dacian formations of some considerable practically inexhaustible groundwater reserves[4,8]:.

For the same reason the artesian water regimen is not influenced by the variation of the annual rainfall quantity, but only by the secular changes of climate. Rovinari coal basin lies at a distance of 7-8 km toward the southern supplying sector already under pressure flow of water, then they begin to have an artesian character[3]:

The waters are weakly mineralized which proves the adjacency of the aquifer to the supplying region and an intense circulation of the groundwater.

2. EXPERIMENTAL STUDY

One of the problems facing any of the coal exploitation pit mines is that of the disturbance and pollution of the regimen of surface and groundwater. If the operation is done in pit-mines mode, it is disturbed the underground waters regimen by changing the direction of the groundwater flow and creating hydrostatic vacuum in the intersecting area of the groundwater aquifer. Surface waters are also affected, thus, they may disappear or the inter-rivers valleys may appear[7, 9]:

The activities developed in the open-pit mine Pesteana Nord generate the following types of wastewater:
- domestic feces wastewater;
- dewatering water coming from rainfall and seepage on the slopes.
The effects on surface water quality are due in particular to the possibility of evacuation of waters loaded with polluting materials from mining activities.

Table 1. Drain sewage (Warehouse Cocoreni)

No.	**Name of test**	**U.M.**	**Results**	**Admittedvalues according A.G.A.77/21.03.2011**
1	PH	upH	5,85	6,5 - 8,5
2	Suspensions	mg/l	50	60
3	CBO_5	mg/l	19,8	25
4	CCO Cr	mg/l	40,93	80,0
5	Filterable residue at 105°C	mg/l	190,2	700
6	Sulphates	mg/l	15,59	150,0
7	Chlorides	mg/l	4,963	50,0
8	Ammonia	mg/l	1,72	3,0
9	Nitrates	mg/l	0,068	1,0
10	Nitrites	mg/l	4,5	10,0
11	Detergents	mg/l	0,24	0,5
12	Total P	mg/l	0,53	1,0

Table 2. Drain sewage (Pește ana Nord open-pit mine)

No.	**Name of test**	**U.M.**	**Results**	**Admittedvalues according A.G.A.77/21.03.2011**
1	PH	upH	5,84	6,5 - 8,5
2	Suspensions	mg/l	48	60
3	CBO_5	mg/l	24,2	25
4	CCO Cr	mg/l	50,02	75,0
5	Filterable residue at 105°C	mg/l	189,2	600
6	Sulphates	mg/l	14,04	100,0
7	Chlorides	mg/l	4,608	50,0
8	Ammonia	mg/l	1,65	3,0
9	Nitrates	mg/l	0,057	0,50
10	Nitrites	mg/l	5,8	7,0
11	Detergents	mg/l	0,3	0,5
12	Total P	mg/l	0,56	0,50

Table 7. Evacuation of the processed technological water (Peşteana Nord open-pit mine)

No.	Name of test	U.M.	Results	Admitted values according A.G.A. 76/21.03.2011
1	PH	upH	5,89	6,5 - 8,5
2	Suspensions	mg/l	36	60
3	CCO Cr	mg/l	36,38	60
4	Filterable residue at 105 ° C	mg/l	190,6	600
5	Sulphates	mg/l	14,77	100,0
6	Chlorides	mg/l	5,672	40,0
7	Phenols	mg/l	0,002	0,3
8	Iron	mg/l	0,049	0,5
9	Magnesium	mg/l	13,31	40
10	Calcium	mg/l	44,89	170

CONCLUSIONS

The miningactivities have negativeeffects on these waters:

a) changes in naturalvalleys, the rivers and creeks or fleets by actions of excavation/ dumping;

The location of the open -pit mine requires modification of the original route of the Jiu river bedthatwasmoved to the old NE shaft, parallel to the national road DN 66.

Water management works and guardchannels have a negative influence on the environmentwhenthey are completed and wellmaintained as operation. By taking the naturalvalleys and their management by regulated sections itisremoved the danger of surface flooding and flash floods or moor formation.

b) changes in the surface water:

- Increasing the flow of surface water through the pitintakedischarges, seepagefromrainfall and layers;
- Increasing the dilution of surface waters fromdischarges of the pit;

c) changes in surface water qualitythroughwastewaterdischargesfrom the administrative headquarters;

d) changes in the quality of surface waters by discharges of stormwater and dewatering;

By greening the areas because of poorcrop production on dumps or slopes of the open-pit mine by which waters are drained, thereis a riskespecially in case of rainfall, waters when a high percentage of solidsmightbecontained. The high percentage of solids in the water channels leads to clogging and guardtheirinvadingwithvegetation, beingnecessary the unsilting of the channels.

e) changing of the relationshipsbetweenaquifers by changinggroundwater flow regimen or the emergence of some new supplyings or drains;

f) loss of existingaquifers and new aquiferemergence, because of the lowered rates;

-itisproduced by the phreaticdewatering of aquifersdeep in the pit;

-itisproduced by changing the continuity of the phreaticaquifer in the dewatering and dump areas.

g) initial loweringlevelsstandpipes as an effectmanifested by lowering the water level, drying up of springs, reducing the flow of groundwatertoward the surface;
h) the emergence of new relationshipsamong the surface water and groundwater in the river system by isolating the hydrographic network in the areas withregularizationworks by obstructing the shutterhead layer and the appearance of new phenomena of fluiddynamics and of hydrochemicalerosion;
The excavations carried out and alsodrillingdewateringcontribute to lowering the water level in the pitslopes. Depending on the filtration coefficient depressioncurves of the phreatic or underground water levelsspanning to longer or smaller distances. With the evolution of the interior dump especially by the excavations completion and dewatering discontinuation, the groundwaterlevels and the groundwater have been recovering.
It mayberecalledthatthisphreaticrecoverywhichis the supplying source of the wells in the area isveryfastdepending on the volume of rainfall.
i) change of the balance of physico- chemicalgroundwaterproduced by the excavation activities or by administrative transport, surface relatedactivities

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